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EXAMINER	
DOAN, KIET M	
ART UNIT	**PAPER NUMBER**
2683	

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Please find below and/or attached an Office communication concerning this application or proceeding.

DETAILED ACTION

Response to Request

1. In response to applicant's request: copy of Provisional application (No. 60/205,811) was filed on May 19, 2000.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kiet Doan whose telephone number is 703-305-4749. The examiner can normally be reached on 8am - 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Trost can be reached on 703-308-5318. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Kiet Doan
Patent Examiner

WILLIAM TROST
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600

05-22-00

A|PROV

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BOX PROVISIONAL PATENT APPLICATION
ASSISTANT COMMISSIONER FOR PATENTS
Washington, D. C. 20231

Docket No.: 0208.0015P

Sir:

Transmitted herewith for filing is a **PROVISIONAL** patent application of:

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Inventor (2): Motti SHECHTER

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For: FIREARM LASER TRAINING SYSTEM AND METHOD EMPLOYING AN ACTUABLE TARGET ASSEMBLY

Enclosed are:

_19_ Pages of the Specification;

_10_ Pages Appendix A; and

_9_ Sheets of Drawings

Enclosed is check #3803 in the amount of $150.00 for payment of the filing fee under 37 C.F.R. §1.16(k).

The Commissioner is hereby authorized to charge payment of any additional fees required for the above-identified application or credit any overpayment to Deposit Account No. 05-0460.

All correspondence regarding this application should be directed to EPSTEIN, EDELL & RETZER at the above address.

Respectfully submitted,

Stuart B. Shapiro
Registration No. 40,169

Via Express-Mail Delivery: May 19, 2000

Express Mail Label No.: EJ240834405US

Atty. Docket No.: 0208.0015P

PROVISIONAL PATENT APPLICATION

Title: Firearm Laser Training System and Method Employing an Actuable Target Assembly

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BACKGROUND OF THE INVENTION

1. Technical Field

The present invention pertains to firearm training systems, such as those disclosed in U.S. Patent Application Serial No. 09/486,342, entitled "Network-Linked Laser Target Firearm Training System" and filed February 25, 2000, and U.S. Provisional Patent Application Serial Nos.: 60/175,829, entitled "Firearm Simulation and Gaming System and Method for Operatively Interconnecting a Firearm Peripheral to a Computer System" and filed January 13, 2000; 60/175,882, entitled "Laser Transmitter Assembly Configured For Placement Within a Firing Chamber to Simulate Firearm Operation" and filed January 13, 2000; 60/175,954, entitled "Firearm Laser Training System Employing Modified Blank Cartridge for Simulating Operation of a Firearm" and filed January 13, 2000; and 60/175,987, entitled "Firearm Laser Training System and Kit Including a Target Having Sections of Varying Reflectivity for Visually Indicating Simulated Projectile Impact Locations" and filed January 13, 2000. The disclosures of the above-mentioned patent applications are incorporated herein by reference in their entireties. In particular, the present invention pertains to a firearm laser training system employing an actuable target assembly to facilitate firearm training, competitions or other firearm related activities.

The above and still further features and advantages of the present invention will become apparent upon consideration of the following detailed description of specific embodiments thereof, particularly when taken in conjunction with the accompanying drawings wherein like reference numerals in the various figures are utilized to designate like components.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a view in perspective of a firearm laser training system having a laser beam directed from a firearm onto an actuable target assembly according to the present invention.

Fig. 2 is an exploded view in perspective and partial section of a laser transmitter assembly of the system of Fig. 1 fastened to a firearm barrel.

Fig. 3 is a schematic block diagram of the firearm laser training system of Fig. 1.

Fig. 4 is a view in perspective of an actuable target assembly of the system of Fig. 1 according to the present invention.

Figs. 5 - 7 are schematic illustrations of exemplary graphical user screens displayed by the system of Fig. 1 for training activities.

Fig. 8 is an exemplary report generated by the system of Fig. 1.

Fig. 9 is a schematic illustration of an exemplary graphical user screen displayed by the system of Fig. 1 for a competition event.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A firearm laser training system employing an actuable target assembly according to the present invention is illustrated in Fig. 1. Specifically, the firearm laser training system includes a laser transmitter assembly 2, actuable target assemblies 10 each having a target 12, a distribution unit 14, a control unit 16 and a computer system 18. The laser assembly is attached to an unloaded user firearm 6 to adapt the firearm for compatibility with the training system. By way of example only, firearm 6 is implemented by a conventional hand-gun and includes a trigger 7, a barrel 8, a hammer 9 and a grip 15. However, the firearm may be implemented by any conventional firearms (e.g., hand-gun, rifle, shotgun, etc), while the laser and firearm combination may be implemented by any of the

simulated firearms disclosed in the above-mentioned patent applications. Laser assembly 2 includes a laser transmitter rod 3 and a laser transmitter module 4 that emits a beam 11 of visible laser light in response to actuation of trigger 7. Rod 3 is connected to module 4 and is configured for insertion within barrel 8 to fasten the laser assembly to the barrel as described below. A user aims unloaded firearm 6 at a particular target 12 and actuates trigger 7 to project laser beam 11 from laser module 4 toward that target. The target assemblies raise and lower targets 12 in accordance with control signals from computer system 18 as described below. The targets are individually raised by corresponding target assemblies 10 at prescribed times for a specific time interval to indicate intended targets for the user, and are lowered in response to the beam impacting the raised targets within that interval (e.g., indicating a hit) or upon expiration of the interval without a beam impact (e.g., indicating a miss).

The system may be utilized to simulate training systems employed by the military or law enforcement, such as the Remote Electronic Target System (RETS). This type of system is typically employed on a firing range and provides various targets that become raised (e.g., pop-up) for the trainee. The laser training system may simulate the view or conditions the trainee encounters in the RETS system, thereby providing angular perception training and angular queuing training (e.g., training to shoot the highest priority threat or closest target). The laser system typically employs seven targets to simulate the RETS system, but may include any quantity of targets. The targets become raised and/or lowered during the training exercise as described below. In addition, the system may be utilized to simulate firearm competitions, such as the International Practical Shooting Competition (IPSC). The object of this competition is to hit each of successive targets in the shortest time interval. The laser system may simulate this competition and measure the time interval for

impacting a series of assembly targets.

Target 12 is used in conjunction with signal processing circuitry adapted to detect the modulated or coded laser beam. The target, by way of example, includes a visible circular bull's eye 40 with quadrant dividing lines 42, and detectors disposed across the target surface to detect the beam. A corresponding assembly control unit analyzes detection signals from the detectors to lower the associated raised target in response to beam impact and forwards information to computer system 18 to provide feedback information to the user via a display (Figs. 6 - 7 and 9) and/or printer 20 (Figs. 3 and 8). The target is scaled to simulate shooting conditions at further distances, such as those within firing ranges, and is similar to the electronic targets disclosed in the above-mentioned patent applications. In addition, the target may utilize masks to display various targets or provide shooting drills (e.g., illustrations of animals with intended target sites, target sites at specific locations or having particular sizes, etc.), such as those disclosed in the aforementioned patent applications. The system may utilize "dry fire" type firearms or firearms utilizing modified blank cartridges (e.g., such as those disclosed in the above-mentioned patent applications) for projecting a laser beam to provide full realism in a safe environment.

An exemplary laser transmitter assembly employed by the training system is illustrated in Fig. 2. Specifically, laser assembly 2 includes laser transmitter rod 3 and laser transmitter module 4. Rod 3 includes a generally cylindrical barrel member 17 and a stop 19 disposed at the barrel member distal end. The barrel member is elongated with a tapered proximal end and has transverse cross-sectional dimensions that are slightly less than the cross-sectional dimensions of barrel 8 to enable the barrel member to be inserted within the barrel. However, the barrel member may be of any shape or size to accommodate firearms of various calibers. Adjustable rings 72, 74 are disposed

about the barrel member toward its proximal and distal ends, respectively. The dimensions of each ring are adjustable to enable barrel member 17 to snugly fit within and frictionally engage barrel 8 in a secure manner. Stop 19 is in the form of a substantially circular disk having a diameter slightly greater than the cross-sectional dimensions of barrel 8 to permit insertion of rod sections proximal of the stop into the barrel. The stop may alternatively be of any shape or size capable of limiting insertion of the rod into the barrel. Barrel member 17 is connected to the approximate center of stop 19, while a post 21 is attached to and extends distally for a slight distance from an approximate center of a stop distal surface. Post 21 is substantially cylindrical and has transverse cross-sectional dimensions similar to those of barrel member 17, but may be of any shape or size. The post includes external threads 23 for facilitating engagement with laser module 4 as described below.

Laser module 4 includes a housing 25 having an internally threaded opening 60 defined in an upper portion of a housing rear wall for receiving post 21 and attaching the laser module to rod 3. The housing and opening may be of any shape or size, while the opening may be defined in the housing at any suitable locations. The laser module components are disposed within the housing and include a power source 27, typically in the form of batteries, a mechanical wave sensor 29 and an optics package 31having a laser (not shown) and a lens 33. These components may be arranged within the housing in any suitable fashion. The optics package emits laser beam 11 through lens 33 toward target 12 or other intended target in response to detection of trigger actuation by mechanical wave sensor 29. Specifically, when trigger 7 is actuated, hammer 9 impacts the firearm and generates a mechanical wave which travels distally along barrel 8 toward rod 3. As used herein, the term "mechanical wave" or "shock wave" refers to an impulse traveling through the firearm barrel. Mechanical wave sensor 29 within the laser module senses the mechanical wave from the hammer

impact and generates a trigger signal. The mechanical wave sensor may include a piezoelectric element, an accelerometer or a solid state sensor, such as a strain gauge. Optics package 31 within the laser module generates and projects laser beam 11 from firearm 6 in response to the trigger signal. The optics package laser is generally enabled for a predetermined time interval sufficient for the target to detect the beam. The beam may be coded, modulated or pulsed in any desired fashion. Alternatively, the laser module may include an acoustic sensor to sense actuation of the trigger and enable the optics package. The laser module is similar in function to the laser devices disclosed in the aforementioned patent applications. The laser assembly may be constructed of any suitable materials and may be fastened to firearm 6 at any suitable locations by any conventional or other fastening techniques.

Referring to Fig. 3, computer system 18 controls system operation and may provide various feedback to a user. The computer system is typically implemented by a conventional IBM-compatible laptop or other type of personal computer (e.g., notebook, desk top, mini-tower, Apple MacIntosh, palm pilot, etc.) preferably equipped with display or monitor 34, a base 32 (i.e., including the processor, memories, and internal or external communication devices or modems) and a keyboard 36 (e.g., including a mouse or other input device). Computer system 18 includes software to enable the computer system to communicate with and control target assemblies 10 and provide feedback to the user. The computer system may utilize any of the major platforms (e.g., Linux, Macintosh, Unix, OS2, etc.), but preferably includes a Windows environment (e.g., Windows 95, 98, NT, or 2000). Further, the computer system includes components (e.g. processor, disk storage or hard drive, etc.) having sufficient processing and storage capabilities to effectively execute the system software. By way of example only, computer system 18 includes a pentium or compatible

processor and at least sixteen megabytes of RAM.

Computer system 18 is connected to control unit 16, while target assemblies 10 are connected to distribution unit 14. Control unit 16 is typically connected to the computer system parallel port and transmits control signals received from the computer system to target assemblies 10 via the distribution unit as described below. The connections between the control unit, distribution unit, computer system and target assemblies are preferably implemented by suitable cables. A printer 20 may further be connected to control unit 16 to print reports containing user feedback information (e.g., score, hit/miss information, etc.). The computer system basically transmits the report information through the control unit to the printer via a control unit selector switch (not shown). The switch is manipulable by the user and selectively directs information from the control unit to either the printer or distribution unit. The switch essentially serves as a power or on/off switch where power is enabled when information is directed to the distribution unit.

The control unit includes a conventional or commercially available microprocessor board, such as a K8000, and relays control signals from the computer system to control the target assemblies. Specifically, the computer system generates controls for the target assemblies in accordance with an entered target sequence. The control information typically includes a command to raise a specific target and the duration to maintain the raised state for a beam impact. The computer system may control each target assembly individually. The control signals are encoded by the computer system and transmitted to the control unit through the computer system parallel port. The control unit receives the encoded signals and decodes them to determine the controls for the individual target assemblies. The control unit checks the current status of the target assemblies (e.g., may request information from an assembly), and in response to proper status, transmits the control

signals to distribution unit 14. The distribution unit receives the control signals and forwards them to the control units of the appropriate target assemblies. Thus, the control unit basically decodes control signals and disseminates them through the various bits of a transmitted signal.

When a target is raised in response to the control signal, hit or miss information associated with that target is transmitted from the corresponding target assembly to the distribution unit. The distribution unit forwards the information to the control unit. This information, by way of example, may be in the form of the target status (e.g., raised or lowered). The control unit encodes the information and transmits it to the computer system for processing. A target lowered within the prescribed interval indicates a hit, and the computer system processes the information for display and reports as described below. A hit target is lowered by the target assembly control unit as described below. The hit or miss information may include any type of information to indicate beam impact on a target.

The control unit typically accommodates a maximum of seven target assemblies, however, the control unit may be connected to additional control units (e.g., up to three or more units) in a master/slave arrangement to accommodate an increased quantity of target assemblies. The master unit basically receives control signals from the computer system and transmits the signals to the appropriate slave units accommodating the target assemblies specified in the control signals. The slave control units are substantially similar to the master unit, but may include fewer components (e.g., be constructed without the parallel port, printer port or power supply), thereby reducing costs.

A target assembly 10 according to the present invention is illustrated in Fig. 4. Specifically, the target assembly includes a frame 50, an assembly control unit 52, a motor 54, a power source or battery 56 and a movable arm 58 having target 12 attached thereto. Frame 50 includes a base 62 and

a side wall 64, each having a generally rectangular configuration. The side wall is substantially perpendicular to the base having its bottom edge joined to a base side edge. A handle 66 is attached to and transversely extends from an upper edge of the side wall interior surface, while legs 68 are attached to and extend from the front and rear lower sections of the side wall to provide stability for the target assembly. The legs each include an elongated bar 70 having a foot 76 disposed at the bar distal end. The base includes assembly control unit 52, motor 54 and power source 56 mounted thereon. Arm 58 is disposed adjacent the side wall exterior surface and is attached to a shaft (not shown) that extends through the side wall and is coupled to motor 54. The arm has an inverted 'L' configuration with the target attached to the arm section extending substantially parallel to the base. The motor rotates the shaft, thereby actuating arm 58 to raise or lower target 12 in response to control signals from assembly control unit 52. A series of switches (not shown) are disposed toward the upper edge of the side wall exterior surface to control arm actuation, while a plurality of stops 78 are disposed in the path of arm movement, via a corresponding bracket 80 mounted to the side wall exterior surface, to limit motion of the arm and target. A pair of cams (not shown) are disposed on the shaft adjacent side wall 64, and are configured to toggle the switches during arm movement. The switches provide signals to assembly control unit 52 to indicate the location of the arm within its motion path, thereby enabling the assembly control unit to control motor 54 accordingly.

Assembly control unit 52 is connected to distribution unit 14, motor 54, power source 56, target 12 and the switches via suitable cables, and controls target assembly operation in accordance with control signals from computer system 18. The assembly control unit includes a commercially available processor and receives control signals from the distribution unit. The assembly control unit interprets the control signals and controls the arm to raise the target for the specified time interval,

or until the raised target is impacted by the beam. Further, the assembly control unit controls target actuation based on the arm position indicated by the switch signals as described above. When a time interval for a raised target expires, the assembly control unit controls motor 54 to lower the target and transmits a miss indication to distribution unit 14 for forwarding to computer system 18. In response to the laser beam impacting target 12, the target sends a signal to the control unit indicating beam impact. The control unit subsequently determines whether or not the impact occurred within the specified time interval, and if so, controls motor 54 to lower the target. The assembly control unit further transmits a hit indication to distribution unit 14 for forwarding to computer system 18. The hit or miss information may include the raised or lowered status of the target to enable the computer system to determine the presence of a hit as described above. The time intervals and target sequence are programmable via computer system 18 to stimulate various scenarios as described below. The assembly control unit may further respond to status inquiries of the target assembly by control unit 16.

In addition, assembly control unit 52 includes a series of indicators, preferably in the form of light emitting diodes (LED), to indicate the status of the target. By way of example only, the assembly control unit housing includes three indicators arranged in vertical relation. An uppermost indicator (e.g., red) indicates target 12 in a raised position, while a central indicator (e.g., green) indicates the beam impacting target 12. This indicator remains illuminated until a successive raising and lowering of the target. A lowermost indicator indicates target 12 in a lowered position. A target power switch controls power to assembly control unit 52.

Computer system 18 includes software to control system operation and provide a graphical user interface for displaying user performance and entering information. In particular, user

information and a particular target sequence is entered into the computer system to control target assemblies 10 (Fig. 5). The sequence typically includes the order in which targets 12 are to be raised and the duration for maintaining the targets in a raised state to permit beam impact. Each target may be individually controlled and selectively specified in the sequence. The computer system executes the sequence by transmitting control signals to the target assembly control units via control and distribution units 16, 14, at the appropriate times. The control signals typically include information directing the assemblies to raise the target for the time interval specified in the sequence as described above.

When a specified target is placed in the raised position, this indicates to the user an intended target. The user subsequently aims firearm 6 at the raised target to project laser beam 11 at that target. In response to beam impact, target 12 provides signals to corresponding control unit 52 to indicate a hit. Control unit 52 provides impact signals (e.g., hit or miss information) to the computer system, and lowers the target in response to a hit or expiration of the specified time interval as described above. Computer system 18 receives the impact information from the target assemblies and calculates a corresponding score. The score may be based on the time required to hit a target and/or distances between the user and the target. Alternatively, the target information may include location information of beam impact (e.g., x and y coordinates) to determine scores based on proximity of the beam impact to an intended target site.

Once scores have been determined, computer system 18 may provide the scores on a graphical user screen. Exemplary screens providing scoring and other information are illustrated in Figs. 6 - 7. These screens typically provide the target sequence including the particular target, the time interval of raised status (T), the lane of the target (L), and target status (S). In addition, these

screens generally provide a hit or miss indication along with ranges, scoring and other information. A report containing similar information relating to performance of a user may be printed by printer 20 and is illustrated, by way of example only, in Fig. 8. It is to be understood that the screens and report may be arranged in any fashion and include any types of information.

The system may be utilized to simulate a RETS range utilized in military or law enforcement training as described above or to simulate a competition event, such as IPSC. Accordingly, the target may be configured to present any type of graphic to simulate conventional targets for these or other types of activities (e.g., E-type Silhouette, military pop-up targets, plates, etc.). An IPSC event typically utilizes five targets (e.g., plates) that are successively raised. The object is to hit each target in succession in the shortest time interval. In order to simulate this event, the system may utilize five target assemblies, while computer system 18 may include a sequence to control the target assemblies in a manner similar to the competition. The computer system functions as described above to control the target assemblies, and measures the time interval for a user to hit each target. The results may be displayed or printed by computer system 18 as described above. An exemplary display for a IPSC competition is illustrated in Fig. 9, however, the display may be arranged in any fashion and include any types of information.

Operation of the system is described with reference to Figs. 1 - 4. Initially, user information and a target sequence is entered into computer system 18 via graphical user screens (e.g., Fig. 5). The system may accommodate any sequence for any quantity of target assemblies (e.g., at least one). Laser transmitter rod 3 is connected to laser module 4 and inserted into barrel 8 of firearm 6 as described above. The laser module is actuated in response to depression of firearm trigger 7. Any of the lasers or firearms disclosed in the above-mentioned patent applications may be utilized (e.g.,

systems employing dry fire or modified blank cartridges). The target assemblies are arranged in a desired configuration and computer system 18 is commanded to control the target assemblies in accordance with the entered sequence. As each target 12 is raised, the user aims the firearm and projects a laser beam at that target. When a raised target is impacted within the specified time interval, the target is lowered and hit information is transmitted to the computer system as described above. In addition, a hit is indicated by the control unit indicator (LED) as described above. If the beam does not impact a raised target within the specified time interval, the target is lowered and miss information is transmitted to the computer system as described above. The computer system receives the hit and miss information and provides feedback information to the user in the form of graphical user screens (e.g., Figs. 6 - 7) and/or a printed report (e.g., Fig. 8) as described above.

Alternatively, the system may simulate a competition, such as IPSC, where the computer system measures the time interval required to hit each of successive targets. The system operates as described above, and further provides the measured time interval on a display (Fig. 9) or printed report.

It will be appreciated that the embodiments described above and illustrated in the drawings represent only a few of the many ways of implementing a firearm laser training system and method employing an actuable target assembly.

The system may include any quantity of target assemblies arranged in any desired fashion. The computer system may be implemented by any conventional or other computer or processing system, and control the target assemblies to operate in any desired target sequence. The computer system may be directly connected to the target assemblies via any communications mechanisms. Further, the system components may be connected by any communications devices (e.g., cables,

wireless, network, etc.) in any desired fashion. The computer system may be in communication with other training systems via any type of communications medium (e.g., direct line, telephone line/modem, network, etc.) to facilitate group training or competitions. The system may be configured to simulate any types of training or competition scenarios. The printer may be implemented by any conventional or other type of printer. The system may raise any quantity of targets simultaneously to provide multiple targets for a user.

The firearm laser training system may be utilized with any type of firearm (e.g., hand-gun, rifle, shotgun, machine gun, etc.), while the laser module may be fastened to the firearm at any suitable locations via any conventional or other fastening techniques (e.g., frictional engagement with the barrel, brackets attaching the device to the firearm, etc.). Further, the system may include a dummy firearm projecting a laser beam, or replaceable firearm components (e.g., a barrel) having a laser device disposed therein for firearm training. The replaceable components (e.g., barrel) may further enable the laser module to be operative with a firearm utilizing any type of blank cartridges. The laser assembly may include the laser module and rod or any other fastening device. The laser module may emit any type of laser beam within suitable safety tolerances. The laser module housing may be of any shape or size, and may be constructed of any suitable materials. The opening may be defined in the module housing at any suitable locations to receive the rod. Alternatively, the housing and rod may include any conventional or other fastening devices (e.g., integrally formed, threaded attachment, hook and fastener, frictional engagement with the opening, etc.) to attach the module to the rod. The optics package may include any suitable lens for projecting the beam. The laser beam may be enabled for any desired duration sufficient to enable the target to detect the beam. The laser module may be fastened to a firearm or other similar structure (e.g., a dummy, toy or simulated

firearm) at any suitable locations (e.g., external or internal of a barrel) and be actuated by a trigger or any other device (e.g., power switch, firing pin, relay, etc.). Moreover, the laser module may be configured in the form of ammunition for insertion into a firearm firing or similar chamber and project a laser beam in response to trigger actuation. Alternatively, the laser module may be configured for direct insertion into the barrel without the need for the rod. The laser module may include any type of sensor or detector (e.g., acoustic sensor, piezoelectric element, accelerometer, solid state sensors, strain gauge, etc.) to detect mechanical or acoustical waves or other conditions signifying trigger actuation. The laser module components may be arranged within the housing in any fashion, while the module power source may be implemented by any type of batteries. Alternatively, the module may include an adapter for receiving power from a common wall outlet jack or other power source. The laser beam may be visible or invisible (e.g., infrared) and may be modulated in any fashion (e.g., at any desired frequency or unmodulated) or encoded to provide any desired information.

The laser transmitter rod may be of any shape or size, and may be constructed of any suitable materials. The rod may include dimensions to accommodate any firearm caliber. The rings may be of any shape, size or quantity and may be constructed of any suitable materials. The rings may be disposed at any locations along the rod and may be implemented by any devices having adjustable dimensions. The stop may be of any shape or size, may be disposed at any suitable locations along the rod and may be constructed of any suitable materials. The post may be of any shape or size, may be disposed at any suitable locations on the rod, and may be constructed of any suitable materials. The post or rod may include any conventional or other fastening devices to attach the laser module to the rod.

The target may be implemented by any of the electronic targets described in the aforementioned patent applications, or any device that can detect laser beam impact. The target may be configured to detect any energy medium having any modulation, pulse or frequency. Similarly, the laser may be implemented by a transmitter emitting any suitable energy wave. The target may be of any shape or size, include any laser detecting circuitry, and present any type of conventional or other target configurations. The target may include any conventional or other fastening devices to attach a mask to the target. The masks may be of any shape or size, may be disposed on the target at any suitable locations and may be constructed of any suitable materials (e.g., may be transparent, translucent, opaque or any combination or degrees thereof). The masks may include any conventional or other fastening devices for attachment to the target. The masks may include any illustration and/or configuration having openings or slots of any shape, size or quantity defined at any suitable locations for training in any types of firearm activities. The masks and targets may be scaled in any fashion to simulate any desired distances.

The target assembly structural components (e.g., frame, base, side wall, legs, arm, etc.) may be of any shape or size, and may be constructed of any suitable materials. The motor may be implemented by any suitable motor or driver. The target may be attached to the arm via any conventional fastening techniques. The legs and stoppers may be attached to the frame via any conventional fastening techniques at any suitable locations. The assembly components may be arranged on the frame in any desired fashion. The handle may be implemented by any conventional or other handle. The cams may be of any quantity, shape or size and may be disposed on the shaft at any suitable locations. The arm may be attached to the shaft or directly to the motor. The power source may be implemented by any type of conventional or other power source (e.g., battery, wall

outlet jack, etc.). The target may be placed in any desired position by the assembly. The assembly control unit may include any quantity of any type (e.g., LED) of indicators of any shape or size to indicate target status (e.g., raised, lowered, hit or miss, etc.). The target assembly may be configured to accommodate any quantity of targets. The assembly control unit may include any conventional or other processor or circuitry to control assembly operation. The switches may be implemented by any conventional or other switches.

The control unit may include any type of conventional or other microprocessor board or other processing circuitry to provide the above-described functions. The control signals and other information may be encoded by or for compatibility with the computer system in any desired fashion. The computer system and other control signals may include any types of information or commands to control the target assemblies in any fashion. The control signals and other information may be formatted in any desired fashion for transmission between the computer system and target assemblies. The control unit may be connected to the computer system via any desired port, and may be directly connected to the target assemblies. The distribution unit may include any conventional or other connection devices or circuitry to distribute the control signals to the target assemblies. The distribution unit may be directly connected to the computer system.

It is to be understood that the software for the various processors and computer systems may be implemented in any desired computer language and could be developed by one of ordinary skill in the computer arts based on the functional descriptions contained herein. The processors and computer systems may alternatively be implemented by hardware or other processing circuitry. The display screens and reports may be arranged in any fashion and contain any type of information. The system may produce any desired type of display or report having any desired information. The

computer system may determine scores based on any desired criteria. The various functions of the processors and computer system may be distributed in any manner among any quantity of processing systems or circuitry.

The present invention is not limited to the applications disclosed herein, but may be utilized for any type of firearm training. Additional exemplary embodiments of the present invention are described in Appendix A appended hereto.

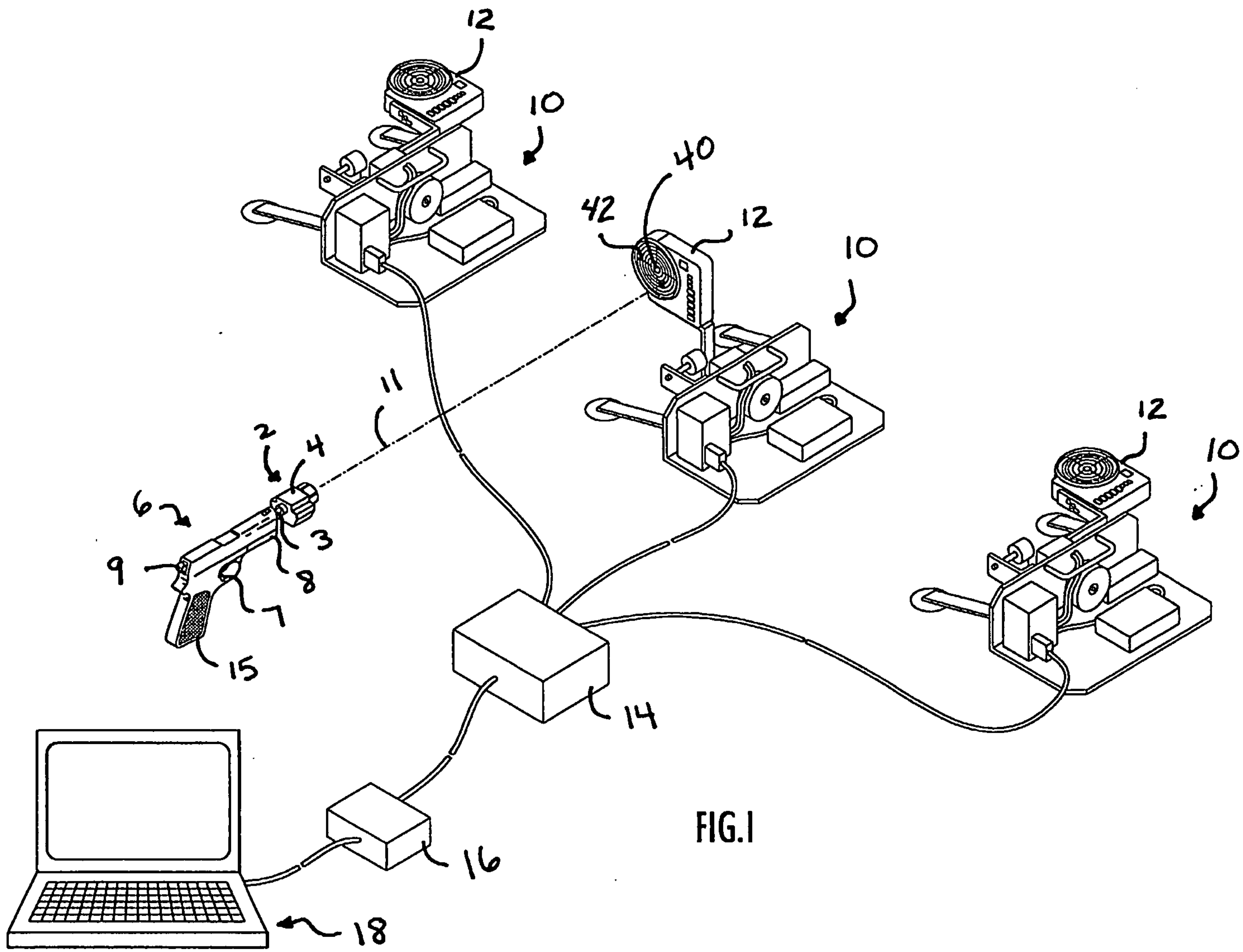


FIG.1

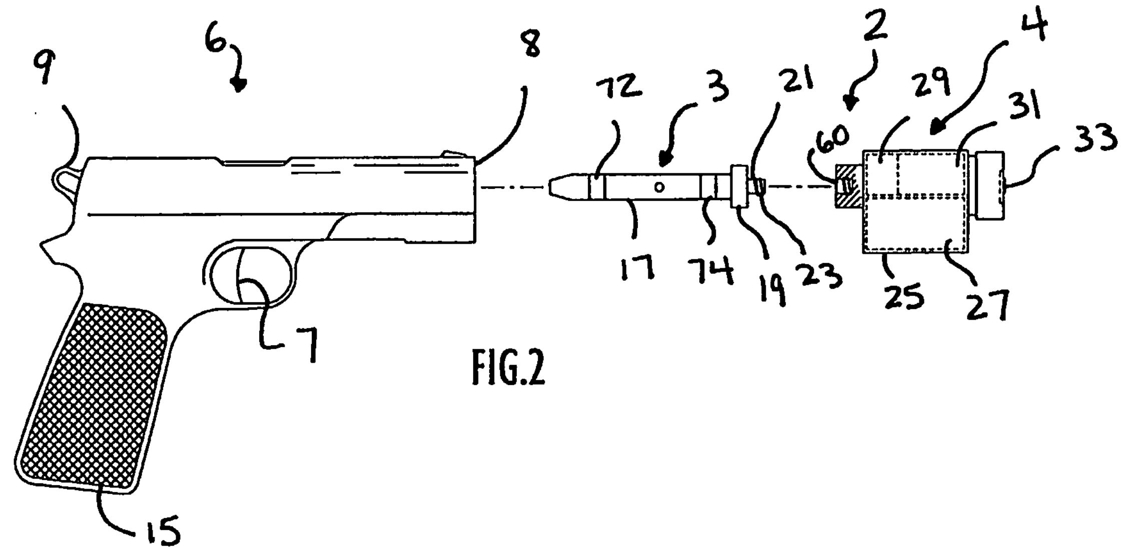
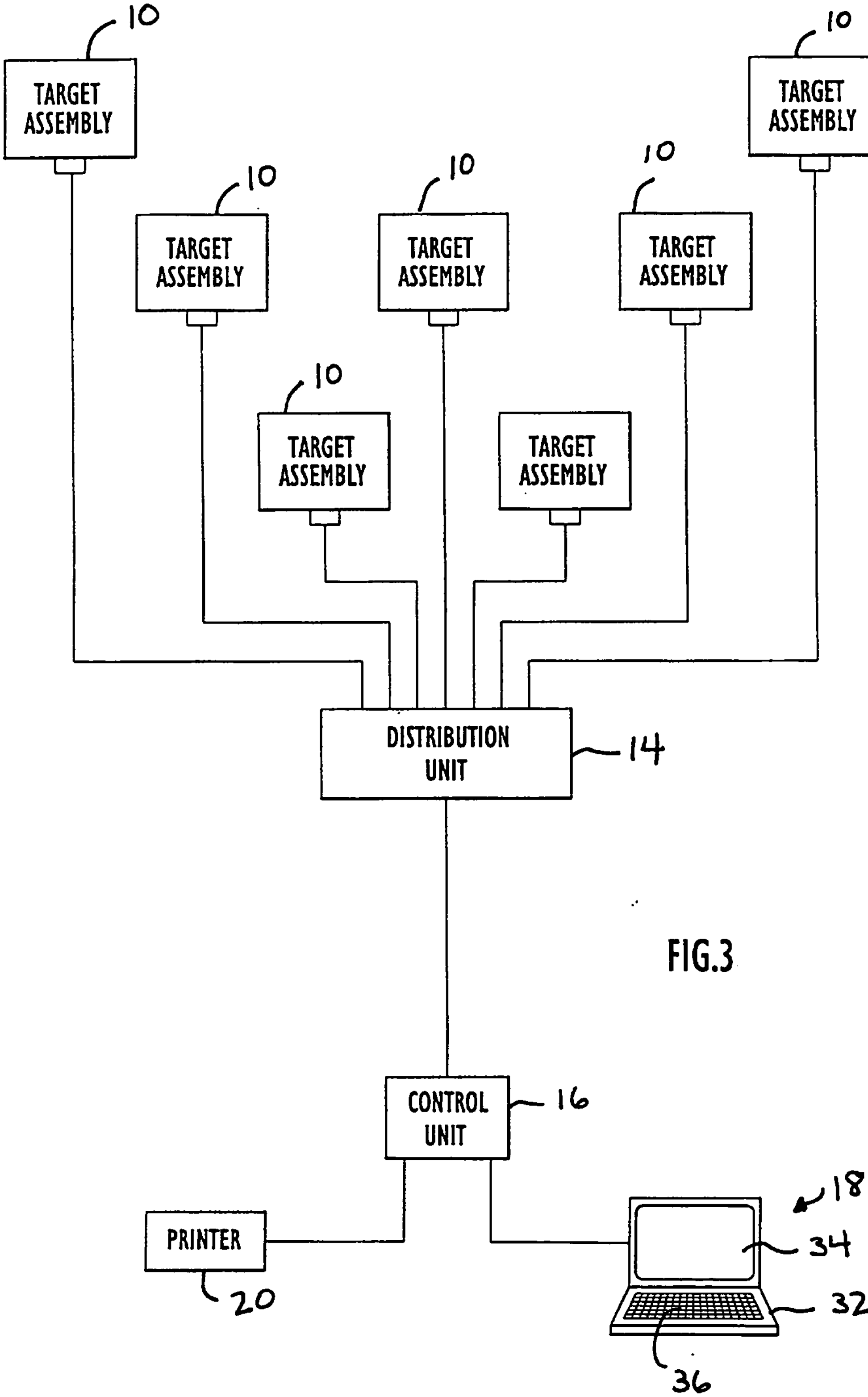


FIG.2



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CONTROL UNIT
16
PRINTER
20
18
34
32
36

FIG.3

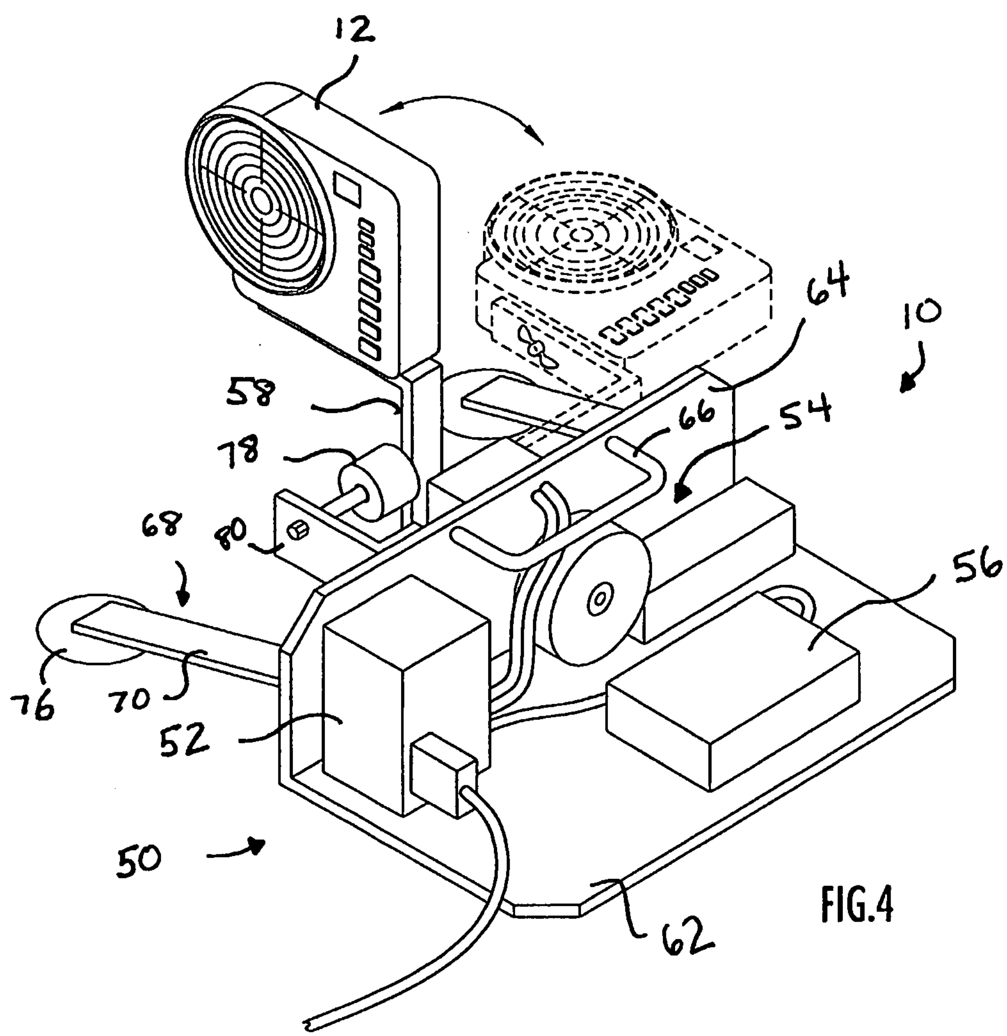


FIG.4

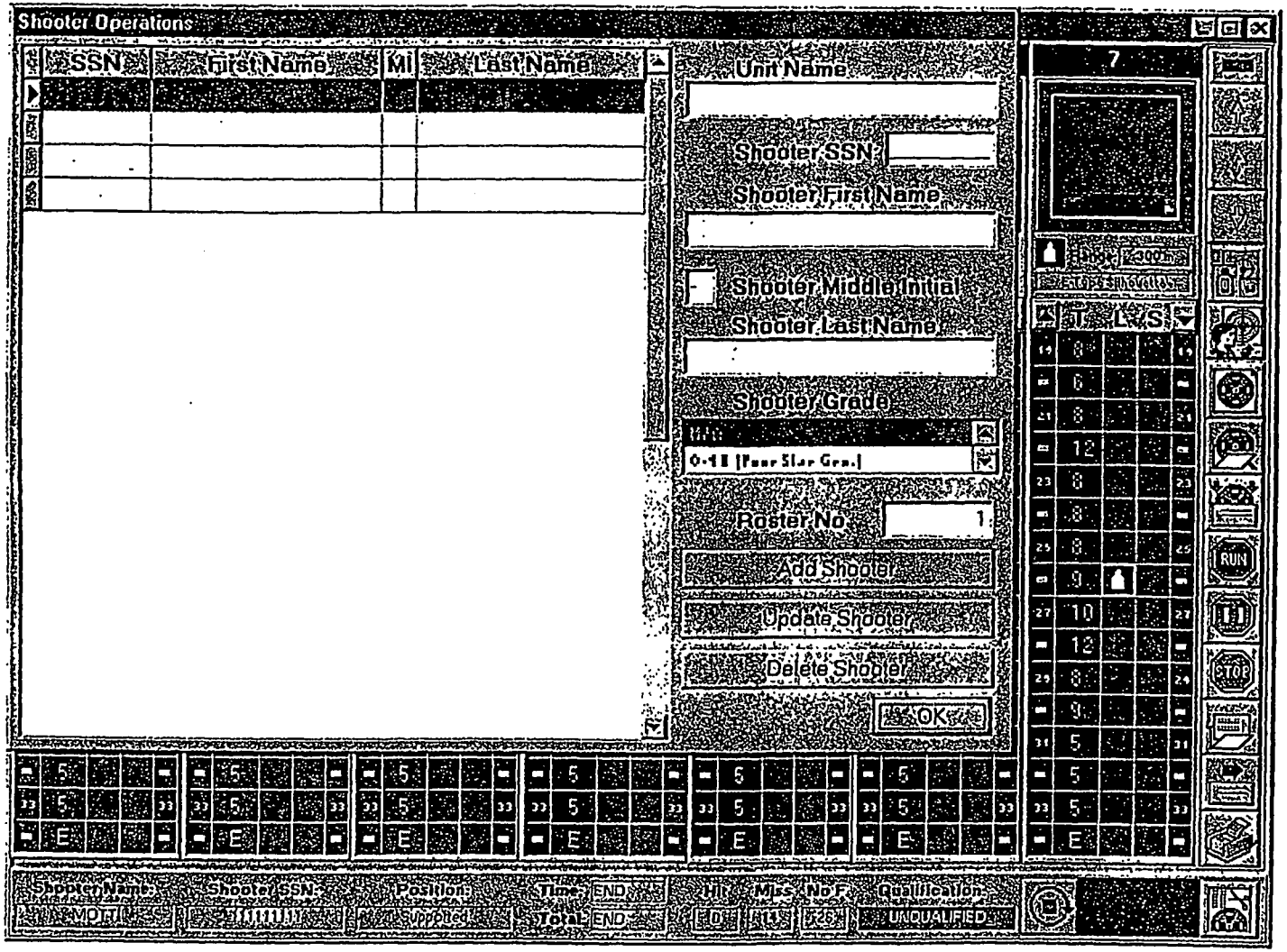


Fig. 5

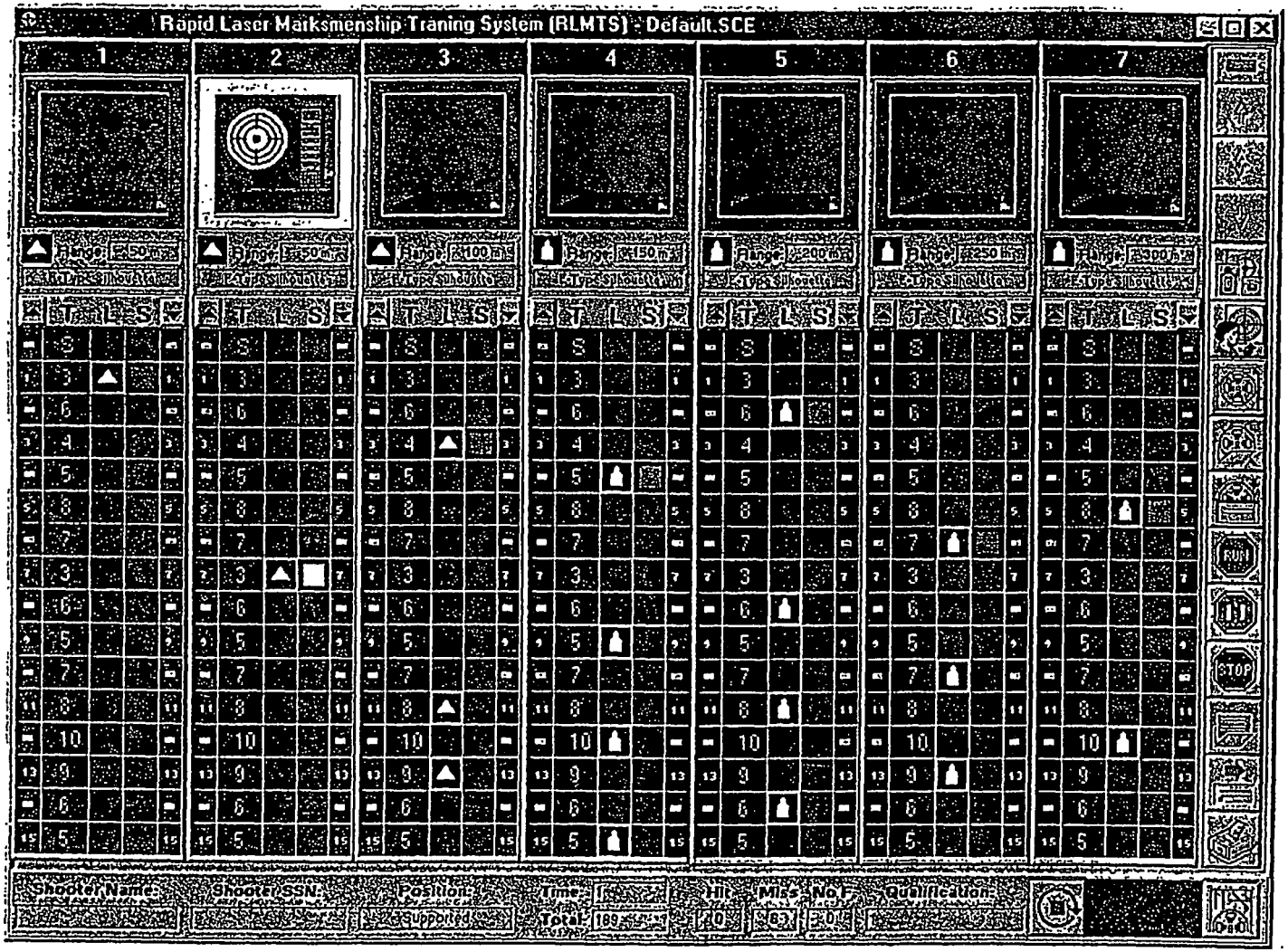

Rapid Laser Marksmenship Traning System (RLMTS) - Default.SCE
1
2
3
4
5
6
7
Range: 50 m
Range: 50 m
Range: 100 m
Range: 150 m
Range: 200 m
Range: 250 m
Range: 300 m
Shooter Name:
Shooter SSN:
Position:
Time:
Hit
Miss
No.F
Qualification:
Total:
Supported

Fig. 6

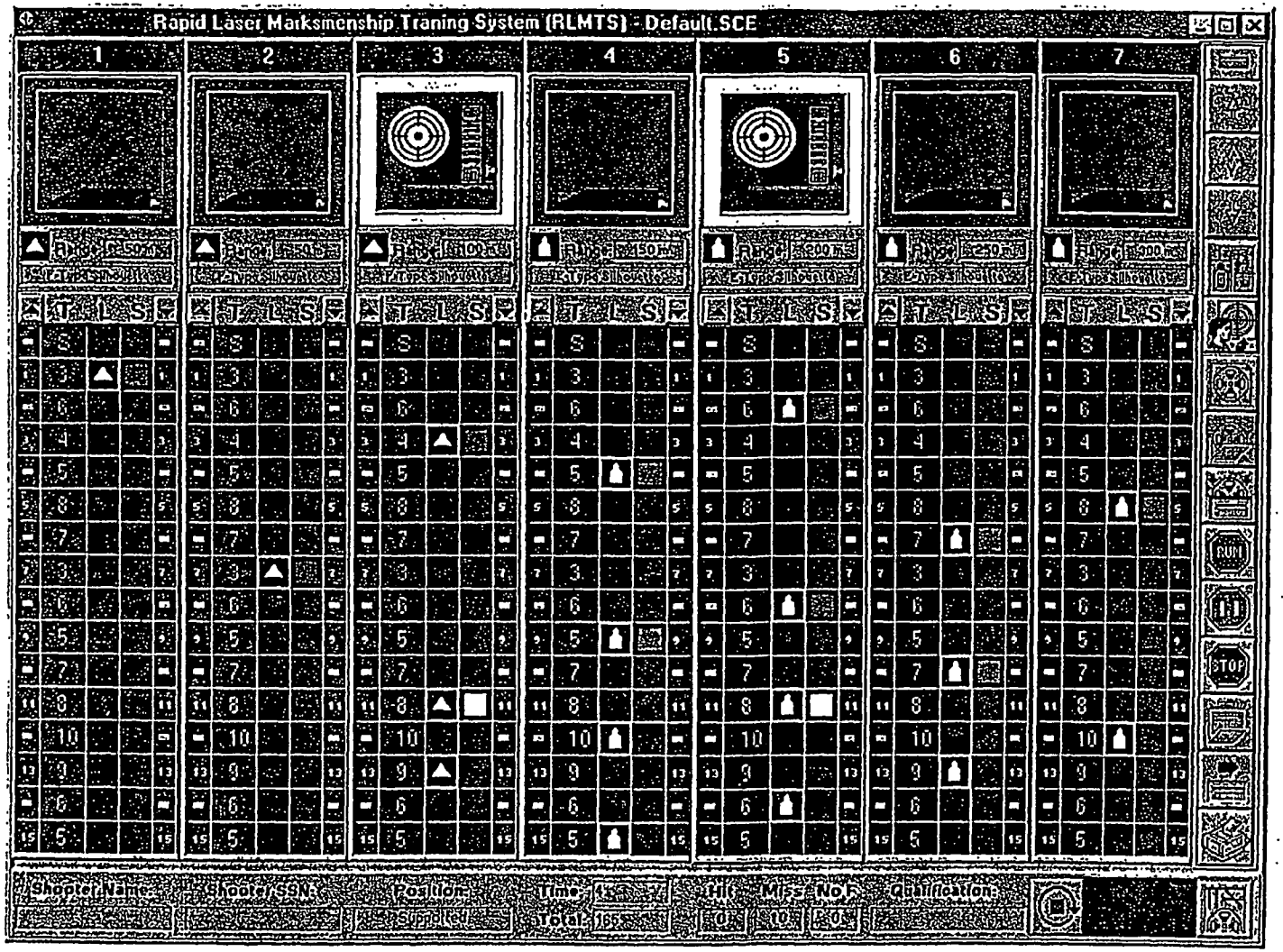

Rapid Laser Marksmenship Traning System (RLMTS) - Default.SCE
1
2
3
4
5
6
7
T
L
S
Shooter Name:
Shooter SSN:
Position:
Time:
Total:
Hit:
Miss:
No F:
Qualification:
STOP

Fig. 7

RAPID LASER MARKSMANSHIP TRAINING SYSTEM
RECORD FIRE SCORE REPORT

Date :

SHOOTER

Name (L,F,M): SSN:

Grade : Unit : Roster No :

INSTRUCTOR

Name (L,F,M):

SCENARIO & SCORE

Seq.	Time	1	2	3	4	5	6	7
1	3	☐X						
2	6					☐X		
3	4			☐X				
4	5				☐X			
5	8							☐X
6	7						☐X	
7	3		☐X					
8	6					☐X		
9	5				☐X			
10	7						☐X	
11	8			☐X		☐X		
12	10				☐X			☐X
13	9			☐X			☐X	
14	6					☐X		
15	5				☐X			
16	6	☐X		☐X				
17	-2							
18	5			☐X				
19	8						☐X	
20	6				☐X			
21	8		☐X			☐X		
22	12				☐X	☐X		
23	8	☐X			☐X			
24	8			☐X				
25	8				☐X			
26	9							☐X
27	10			☐X		☐X		
28	12				☐X		☐X	
29	8			☐X	☐X			
30	9			☐X		☐X		

TARGETS

1	☐	: F-Type Silhouette	Range:	50 m.
2	☐	: F-Type Silhouette	Range:	50 m.
3	☐	: E-Type Silhouette	Range:	100 m.
4	☐	: E-Type Silhouette	Range:	150 m.
5	☐	: E-Type Silhouette	Range:	200 m.
6	☐	: E-Type Silhouette	Range:	250 m.
7	☐	: E-Type Silhouette	Range:	300 m.

QUALIFICATION SETTINGS

EXPERT	: From	36	To	40
SHARPSHOOTER	: From	30	To	35
MARKSMAN	: From	23	To	29
UNQUALIFIED	: From	0	To	22

STARTING POSITION

SUPPORTED

LEGEND

☐ : Position Change to Unsupported ☐ : Hit ☐ : No Fire

☐ : Position Change to Supported ☐ : Miss ☐ : Down

INSTRUCTOR REMARKS

Supported Hits : 0 Unsupported Hits : 0 Total Hits : 0

Supported Misses : 0 0 Unsupported Misses : 0 Total Misses : 0

Supported No Fire: 0 Unsupported No Fire: Total No Fire: 0

QUALIFICATION

EXPERT

Fig. 8

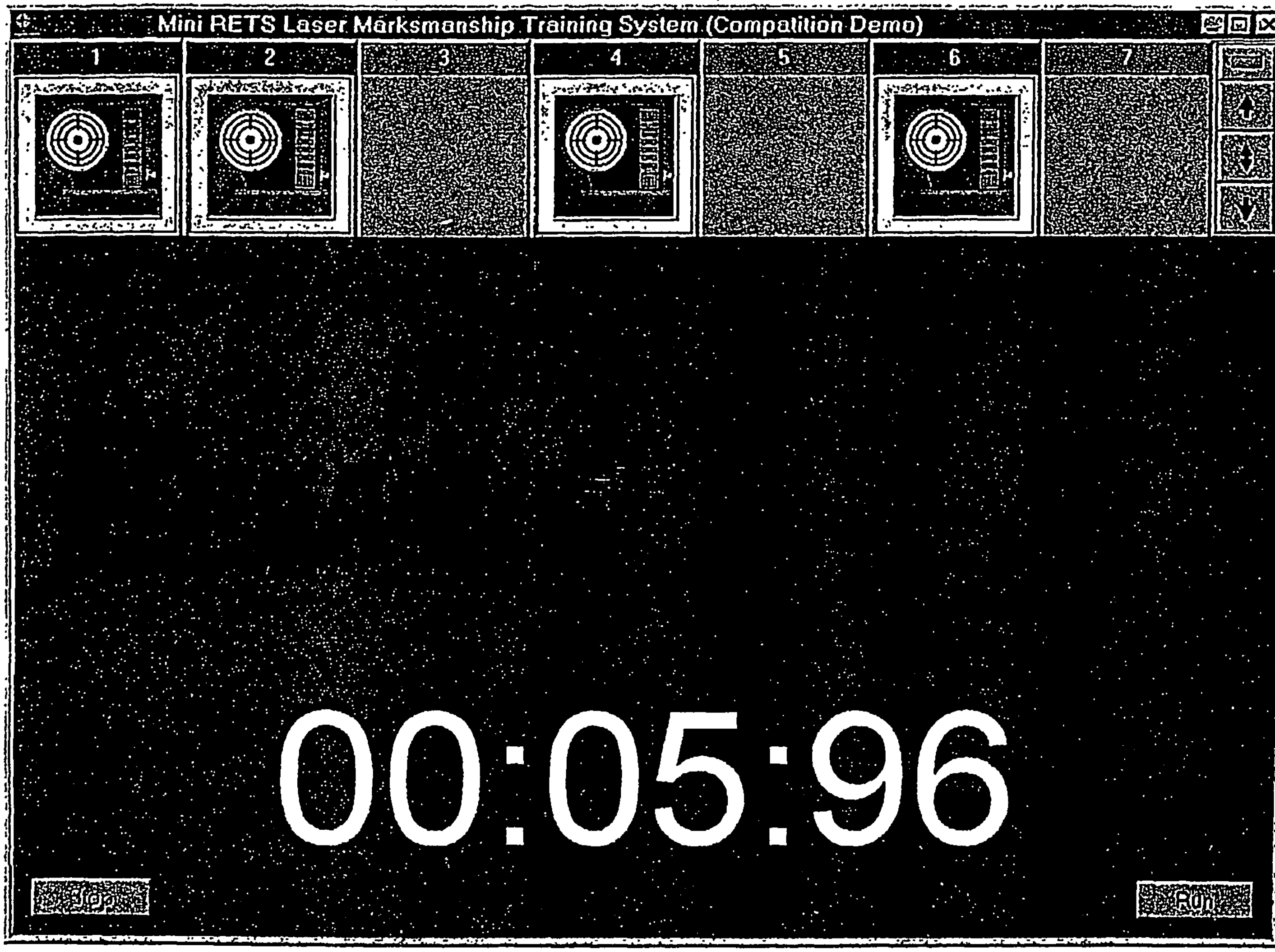


Fig. 9

APPENDIX A

Rapid Laser Marksmanship Training System
(RLMTS)
Design Report

Given Specifications:

. Electronic Targets will be used for Shoot detection.
. Lifter mechanism with motor and battery combination will be used.
. The computer will control at least 7 targets (Basic System). It will control lifter positions with the programmable real-time scenarios.
. The computer will collect the hit detection information from targets.
. The real-time controlled lifters will go up, stays up for a programmed period of time. When any target gets hit during this period of time the corresponding target will go down immediately and will notify the computer for the hit detection. If the programmed time elapsed for any target it will go down immediately and it will notify the computer for miss information. This operation will be programmable for each individual lifter. With the scenarios the time intervals for stay-up stay-down will be programmable by the user. For one session targets can go up and down several times.
. The distance between the computer and the lifters will be:
    Minimum: 15m
    Maximum: 25m
. Reference Document FM23-9, Section VI. Field Fire Range, Page G-33 to G-47

RLMTS Designer Specifications:

Given Specifications listed on the previous paragraph have been achieved.

The RLMTS includes following units:

Given Units
- Computer
- Printer
- Lifters (X 7) (Modified by the designer)

Designed Units
- RLMTS Computer Controlled Interface Unit (CCIU)
- RLMTS Cable Distribution Box (CDB)
- RLMTS Lifter Controller Box (LCB) (X 7)
- RLMTS Cable Harness (CH)

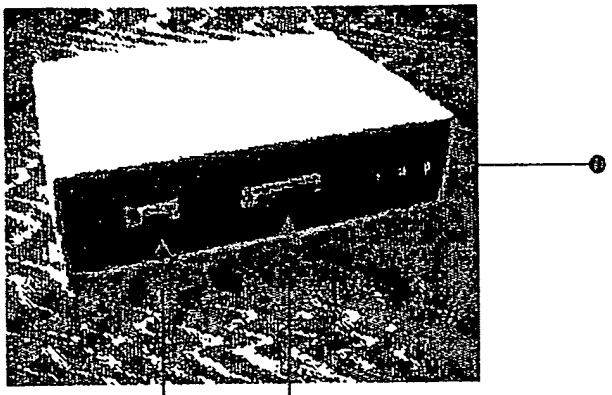
System Units Locations and functions:

CCIU is a computer interface unit it is located next to the computer. It is connected to the computer through parallel port of the computer. The CCIU actually controls the lifters with the instructions of the computer. The computer will be furnished with the user-friendly Windows environment software for the communication between CCIU and the computer. With this software user will be capable of programming the scenarios and get a report in the FM 23-9 standard. Because of the usage of the parallel port of the computer by CCIU, the CCIU has a printer port output. The printer, the computer and CCIU will be at the 0 meter (Instructor position). The connection between PC to CCIU and CCIU to Printer are designed for standard two directional printer cables. Without printer usage, the CCIU is tested with 10 meters cable between Computer and CCIU. With the printer usage standard cabling must be used.

The CCIU is connected to the CDB. The wire between CCIU and CDB is:
- 20 meters 25 wire Cable (system tested for 50 meters)
- Female 25 pin DSUB connectors on both sides of the cable
- One to one wire connection

The CDB is a wire distribution box. CCIU signals distributed to 7 DSUB (9-pin male) connectors for lifter connections. The distributed lifters with LCB are connected to the CDB with a cable:
- 5 meters 4 wire cable (it can be longer depending on the CCIU-CDB cable)
- Female 9 pin DSUB connectors on both sides of the cable
- Four wire one to one connections

CCIU Visual Specifications:

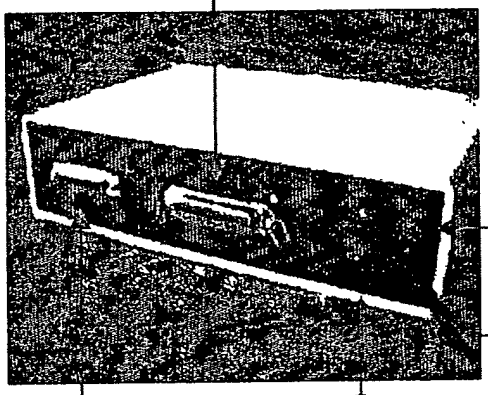


Communication Indicators (They are useful for diagnostic purposes)

To Next CCIU

To CDB (Lifter Control I/O)

From Computer



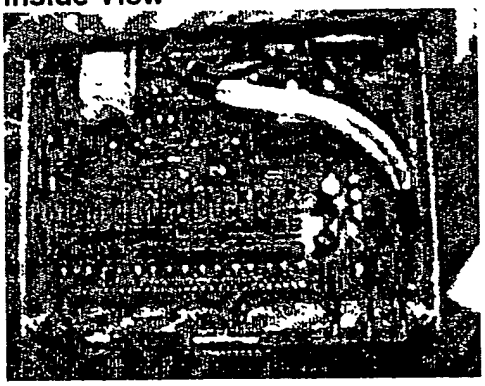
Power LED

Power Cable

To Printer

Power ON/OFF (Printer/Lifter Selection)

Inside View

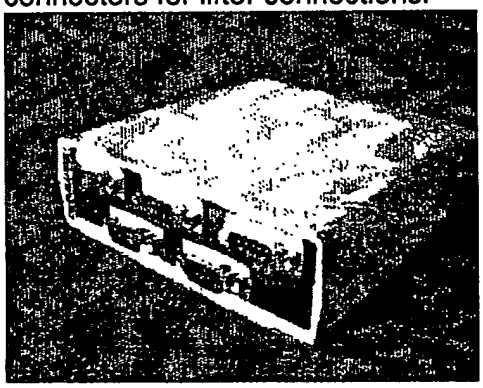


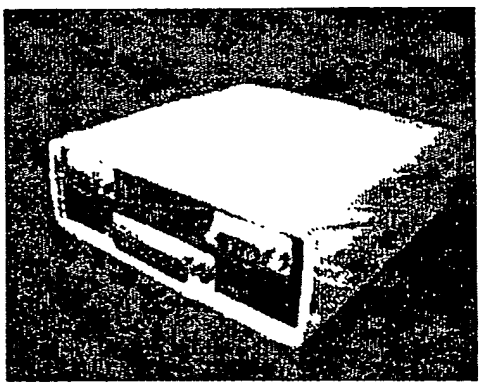
CCIU Technical Specification:

- Standard Parallel Port Connection
- Ground isolation between computer and CCIU with optocouplers.
- Ground isolation between Lifter I/O port and CCIU interface with the usage of optocouplers for inputs and outputs.
- Ground isolation between printer and CCIU
- CCIU has a printer port. It works like a printer select box. With the power switch it transfers the computer parallel port to printer.
- Power LED. It is designed for two purposes. It shows if the power is ON and it displays if the lifter port power is functional. CCIU real power functionality can be seen from communication indicator LED's. Lifter port power and ground completely separated from CCIU itself for safety purposes. None of the faulty units can easily cause malfunction on other unit because of the ground isolations in the system.
- Communication indicators have different meaning in the system. They are useful for the diagnostics of the system. It will be explained later.
- Input Power (115V 250mA fused) direct connection
- Power ON/OFF or Printer/Lifter selection switch
- Lifter port: 7 outputs for lifter up/down drive, 7 outputs for session start or Target reset drive, 7 inputs for hit detection, 4 lifter ground reference connection. Ground isolation with the CCIU. Reset outputs 500mA open collector. Hit detection inputs 12V/30mA (minimum 5V/5mA for sense) optocoupled inputs. Lifter Up/Down outputs 50ma with optocoupled outputs.
- Minimum Conversion time between computer output and lifter I/O port is 800 µsec.
- Each lifter can be controlled separately.
- Lifter I/O port LED's are placed in the CCIU Box for diagnostic purposes.
- One Master CCIU can control 7 lifters by itself but 3 more slave units can be used to control 28 lifters. Slave CCIU is cost effective than master unit. It is using the same PCB with fewer components and does not have parallel port, printer port and power supply.

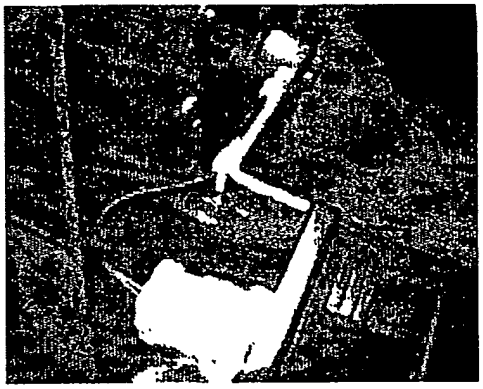
CDB Specification:

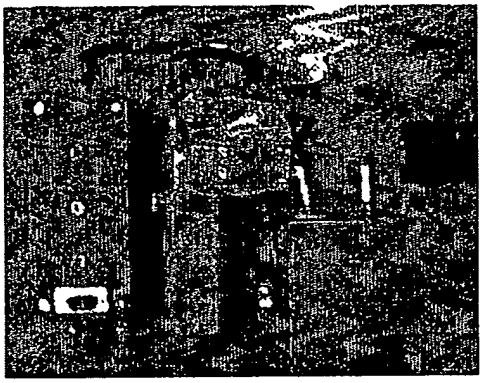
It is a distribution box. CCIU signals distributed to 7 DSUB (9-pin male) connectors for lifter connections.





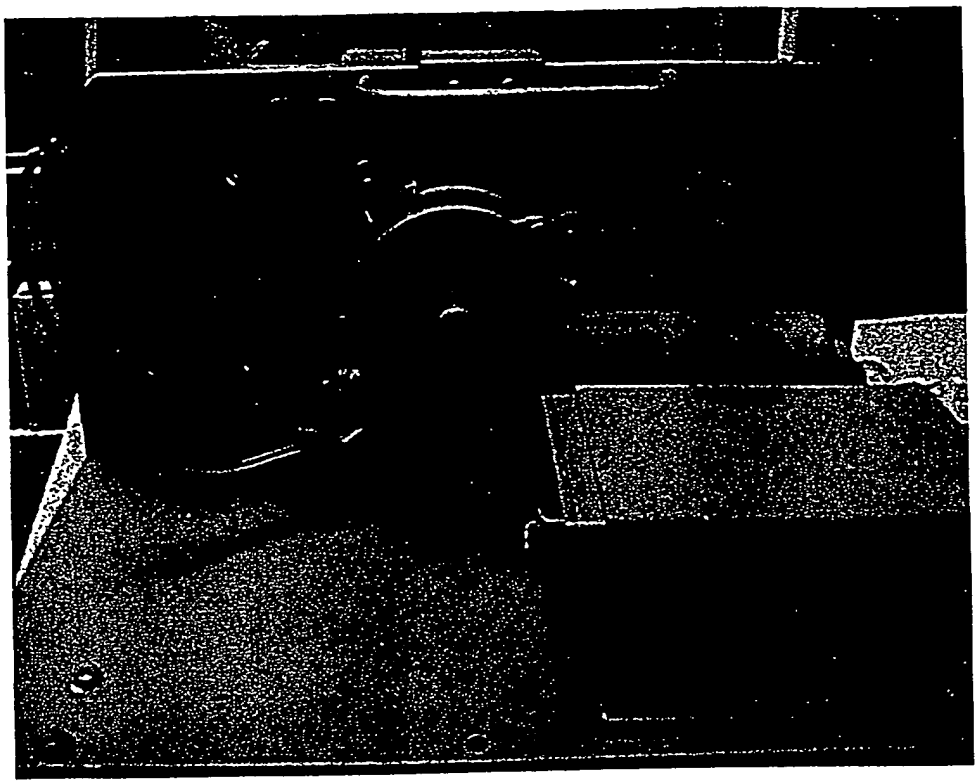
Lifter and LCB Specs:



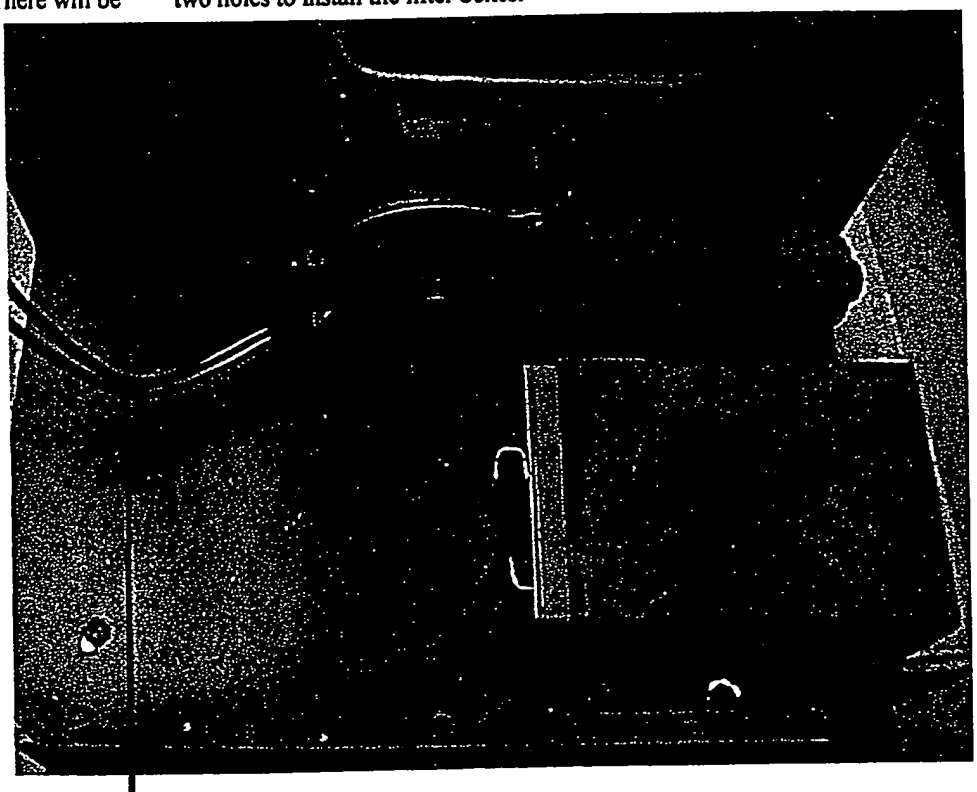


Front and back views of the lifter

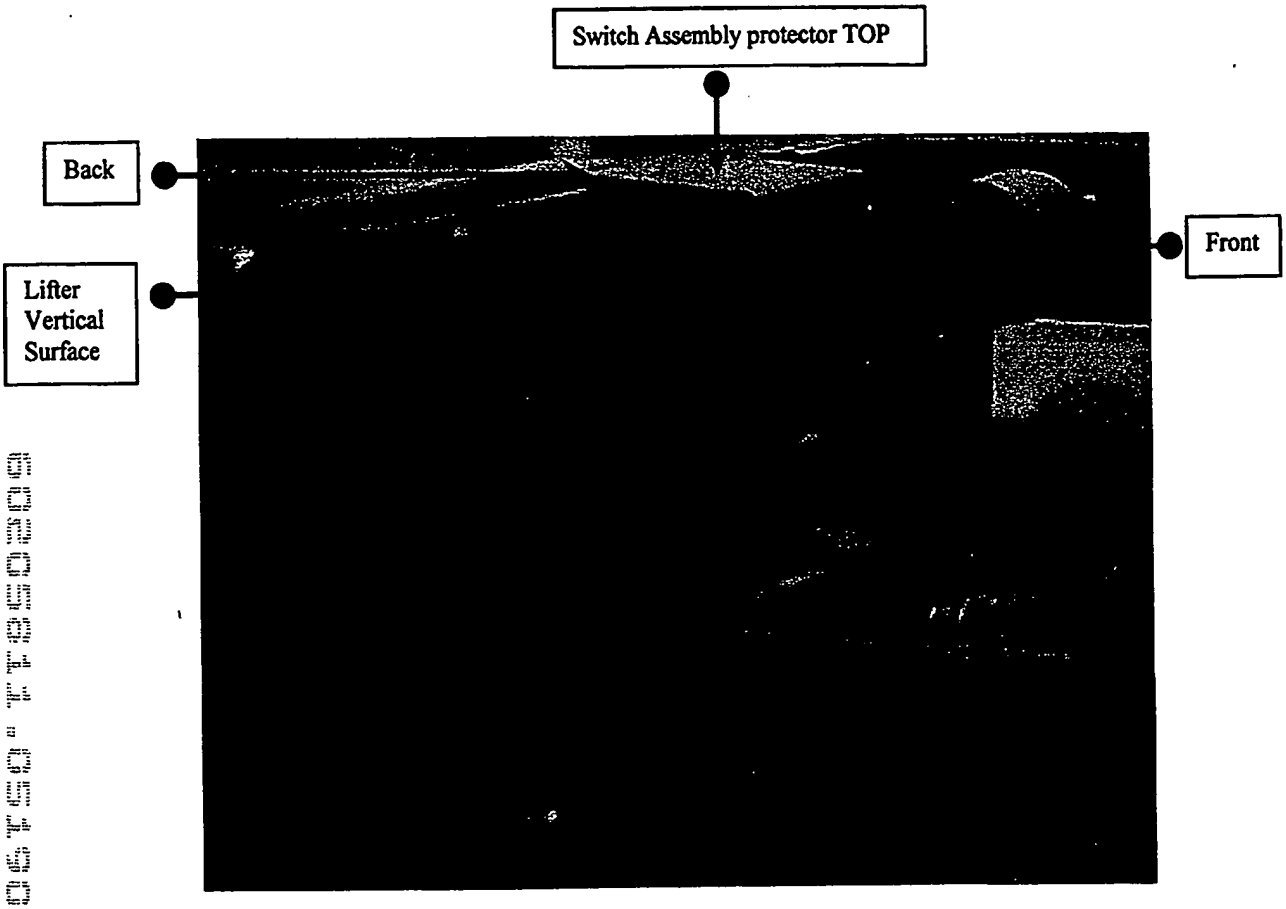
LCB Controlled by CCIU for UP/DOWN operations of the lifter but when the target gets hit it is automatically makes the target down. Indication LED's displays Lifter UP (Top Red), Hit Detect (Green Centre), Lifter Down. The Hit detect LED stays on until next lifter Down and Up operation. The LCB does not have a power on/off switch. It can be turn On/Off with the target ON/OFF switch. With the CCIU control it can reset the hit count information on the target display for session starts. It is fused for 5A at 6V motor power side. When it is in power off stage Lifter will stay down. The 6V dc power input is prototyped in a way that it can be driven with external power supply too. The power supply needs standard power jug to plug to the LCB. If you apply force to the lifter to make up or down it will burn the fuse at LCB. Because of this feature the motor output power has a power connector output. You can disconnect this output from motor and you can move the mechanism for transportation purposes. This is also useful for the test and design purposes. For the software generation and test designer can use this feature and can identify the operations with the usage of the LED's. The location of the LED's will change if it is useful for the shooter to see them. The time between hit to fall is less then 1μ sec.

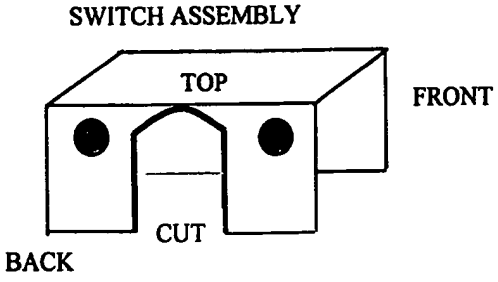


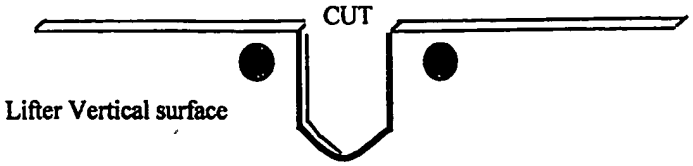
There will be two holes to install the lifter boxes.



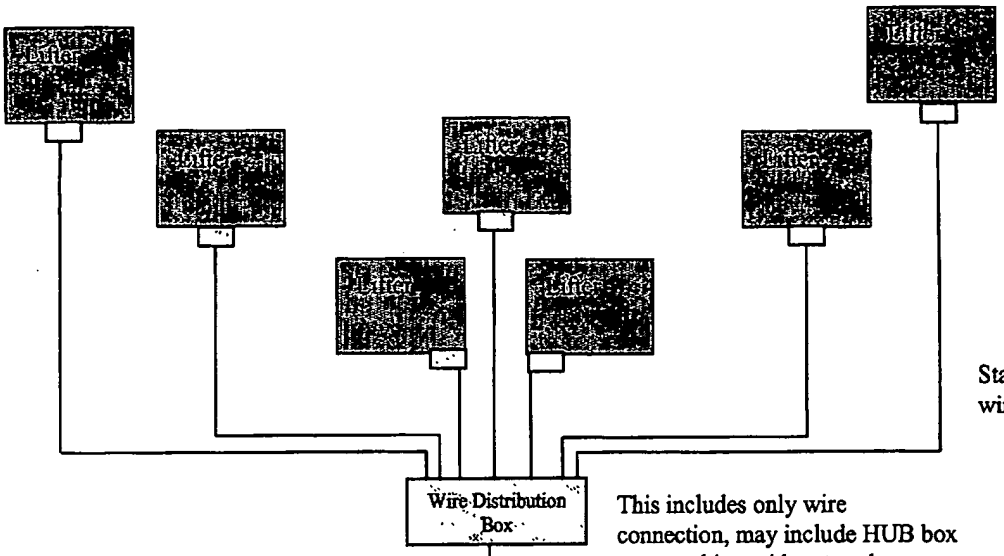
This screw must be flat top screw
The base of the box should lay on the surface of the lifter.


Switch Assembly protector TOP
Back
Front
Lifter
Vertical
Surface


SWITCH ASSEMBLY
TOP
FRONT
CUT
BACK


CUT
Lifter Vertical surface

These cuts will be used to pass cables for switches and Target from one side to another and there will be no soldering for us.



Cable with 20 or more wires (Shielded preferred) with 25pin DSUB Mail Connectors 20 meter